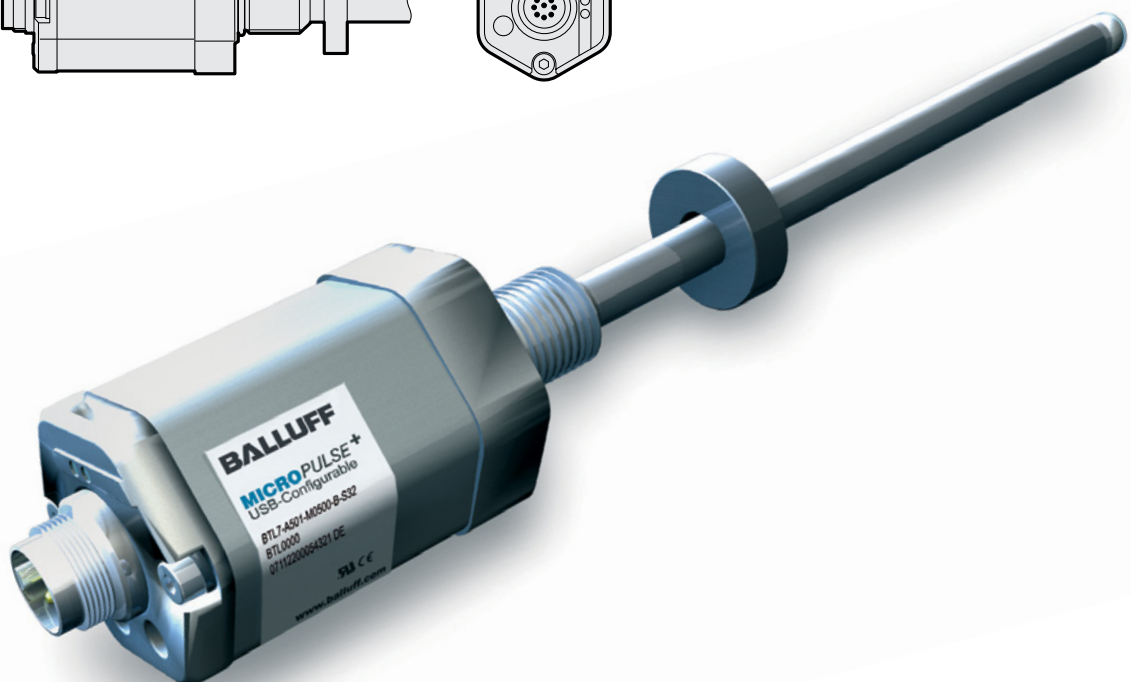
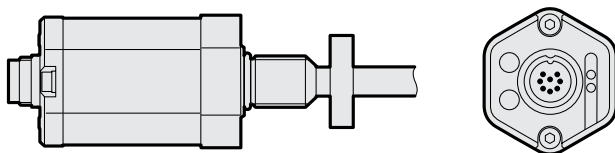


BTL7-A/E501-M_ _ _ _-A/B/Y/Z(8)-S32/S115/KA_ _

User's Guide



www.balluff.com

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1 Notes to the user

1.1 Validity

This guide describes the construction, function and setting possibilities for the BTL7 Micropulse Transducer with analog interface. It applies to models **BTL7-A/E501-M__-A/B/Y/Z(8)-S32/S115/KA__** (see part numbering code on page 24).

The guide is intended for qualified technical personnel. Read this guide before installing the transducer and placing it in operation.

1.2 Symbols and conventions

Enumerations are shown in list form with bullet points
Action instructions are indicated by a preceding triangle.
The result of an action is indicated by an arrow.

- ▶ Action instruction 1.
- ⇒ Action result.

Cross-references indicate where additional information on the topic can be found (see "Technical data" on page 21).



Note, tip

This symbol indicates general notes.



These symbols indicate the buttons on the calibration device.



Symbols of this type indicate the LED indicators.

1.3 Scope of delivery

- BTL7 transducer,
- calibration device,
- condensed guide.



The magnets are available in various form factors and must be ordered separately.

1.4 Approvals and markings



UL authorization
File No.
E227256

US Patent 5 923 164

The US patent was awarded in connection with this product.



The CE Mark verifies that our products meet the requirements of EC Directive 2004/108/EG (EMC Directive).

The transducer meets the requirements of the following Generic Standards:

- EN 61000-6-2 (noise immunity)
- EN 61000-6-4 (Emission)

Emission tests:

- RF emission
EN 55011 Group 1, Class A and B

Noise immunity tests:

- | | |
|--|------------------|
| – Static electricity (ESD)
EN 61000-4-2 | Severity Level 3 |
| – Electromagnetic fields (RFI)
EN 61000-4-3 | Severity Level 3 |
| – Electrical fast transients (Burst)
EN 61000-4-4 | Severity Level 3 |
| – Surge EN 61000-4-5 | Severity Level 2 |
| – Conducted interference induced
by high-frequency fields
EN 61000-4-6 | Severity Level 3 |
| – Magnetic fields
EN 61000-4-8 | Severity Level 4 |

2

Safety

2.1 Intended use

The BTL7 Micropulse Transducer together with a machine controller (PLC) comprises a displacement measurement system. It is fitted into a machine or piece of equipment for its application. Flawless function in accordance with the specifications in the technical data is ensured only when using original BALLUFF accessories, and use of any other components will void the warranty.

Opening of the transducer or non-approved use are not permitted and will result in loss of warranty and void any liability claims against the manufacturer.

2.2 General safety notes for the transducer system

Installation and startup are to be performed by trained technical personnel only.

The **operator** is responsible for ensuring that local safety regulations are observed.

In particular, the operator must take measures ensure that a defect in the displacement measurement system will not result in hazards to persons or equipment.

When defects and non-clearable faults in the transducer occur, take it out of service and secure against unauthorized use.

2.3 Meaning of the warnings



Note!

The pictogram used with the word "Caution" warns of a possible hazardous situation affecting the health of persons or equipment damage. Ignoring these warnings can result in injury or equipment damage.

- Always observe the described measures for preventing this danger.
-

BTL7-A/E501-M__-A/B/Y/Z(8)-S32/S115/KA__ Micropulse Linear Transducer - Rod-Style

3

Construction and Function

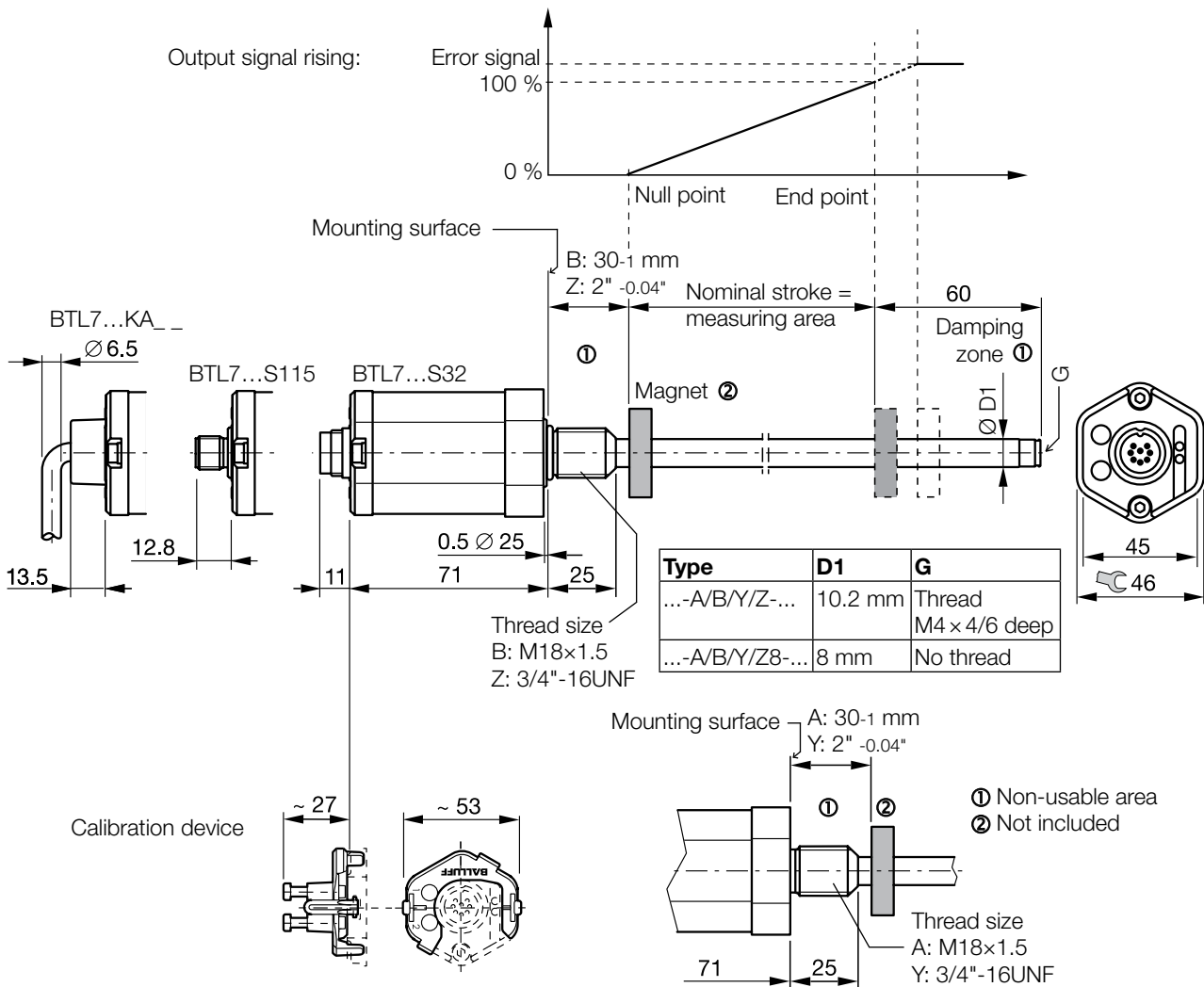


Fig. 3-1: BTL7 Transducer... construction and function

3.1 Construction

Electrical connection: Depending on the version the electrical connection is made via a cable or a connector (see part numbering code on page 24).

BTL housing : Aluminum housing containing the processing electronics.

Mounting thread: It is recommended that the transducer be installed using its mounting threads.

- BTL7-...-A/B: M18x1.5,
- BTL7-...-Y/Z: 3/4"-16UNF.

The transducers having Ø 10.2 mm include an additional thread at the rod end to be used for support with long stroke lengths.

Magnet: Defines the position to be measured on the waveguide. Magnets are available in various form factors and must be ordered separately (see accessories on page 22).

Nominal stroke length: Defines the travel/length area available. Rods with various nominal stroke lengths are available depending on the model:

- Ø 10.2 mm: Nominal stroke length from 25 mm to 7600 mm;
- Ø 8 mm: Nominal stroke length from 25 mm to 1016 mm.

Damping zone: Unusable zone at the end of the rod which may not be entered without generating a spurious signal.

Calibration device: Additional device for calibrating the transducer.

3 Construction and function (cont.)

3.2 Function

The BTL7 transducer contains the waveguide which is protected by an outer stainless steel tube (rod). A magnet is moved along the waveguide. This magnet is attached to the moving member of the equipment whose position is being determined.

The magnet defines the position to be measured on the waveguide.

An internally generated INIT pulse together with the magnetic field from the magnet generates a torsional wave in the waveguide through the magnetostrictive effect which propagates along the waveguide at ultrasonic velocity.

The component of the torsional wave which arrives at the end of the waveguide is absorbed in the damping zone to prevent reflection. The component of the torsional wave which arrives at the beginning of the waveguide is converted by a coil into an electrical signal. The travel time of the wave is used to calculate the position. Depending on the BTL7 version, this information is made available as a voltage or current with rising or falling gradient.

The following functions can be selected for the output values:

- Position
- Velocity (with or without sign)
- Differential position

2 outputs are provided which can be allocated independently of each other. 2 magnets may be used.

i The entire range of functions can only be configured using the "Micropulse Configuration Tool" PC software. For this the USB communication box must be connected (see Accessories on page 23). The transducer can be calibrated without PC software by using the calibration device (see page 14 ff).

3.3 LED indicator

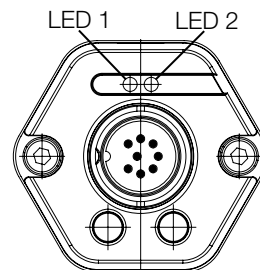


Fig. 3-2: BTL7 LED indicators

i In normal operation the LEDs indicate the operating states of the transducer. LED 1 is assigned to Output 1, LED 2 is assigned to Output 2.
 In calibration mode the LEDs indicate additional information (see page 17 ff).

LED 1/LED 2	Operating status
green	Normal function (magnet is within the measuring range)
red flashing	Measuring range left (magnet is outside the measuring range)
red	Error (no magnet or magnet outside the limits)

Tab. 3-1: LED indicators in normal operation

4 Installation (continued)

4.3 Installing the transducer



Note!

Improper installation can compromise the function of the transducer and result in increased wear.

- ▶ The flange surface of the transducer must make full contact with the mounting surface.
- ▶ The hole must be perfectly sealed (O-ring/flange gasket).

- ▶ Construct threaded hole (and, if needed, recess for the O-ring) as per Fig. 4-3 and Fig. 4-4.
- ▶ Thread the transducer into the threaded hold (max. tightening torque 100 Nm).
- ▶ Install magnet (accessory).
- ▶ Nominal stroke length 500 mm or longer: Fasten rod at its end (only possible for 10.2 mm rod) or support it.



Appropriate nuts for the mounting thread are available as accessories (see page 22).

4.3.1 Installation recommendation for hydraulic cylinders

When sealing the hole using a flat gasket, the max. operating pressure is reduced based on the larger surface subjected to pressure

For horizontal installation in hydraulic cylinders (nominal stroke lengths > 500 mm) we recommend using a slide element.



Detailed dimensioning is the responsibility of the cylinder manufacturer.

The slide element material must be matched to the load situation, the medium used and the relevant temperatures. Possible materials include Torlon, Teflon or bronze.

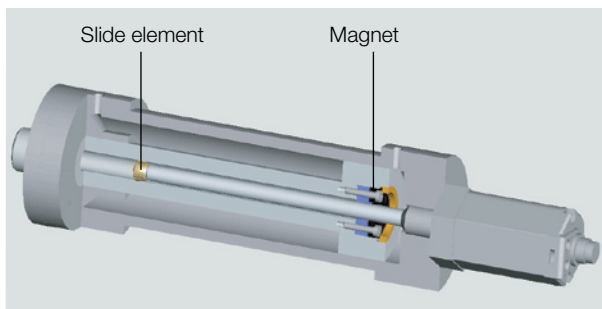


Fig. 4-5: Installation in a hydraulic cylinder

The slide element may be threaded or glued on.

- ▶ Secure the screw from loosening or becoming detached.
- ▶ Use a suitable glue.

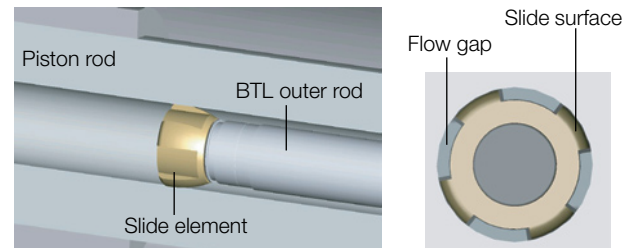


Fig. 4-6: Detail view and top view of slide element

There must be a sufficient gap between the slide element and the piston hole to allow for the flow of hydraulic fluid.

Methods of attaching the magnet:

- Screws
- Threaded ring
- Press-in
- Indentation (center punching)

The hole in the spacer must be matched to the slide element for optimal guiding of the protective tube.

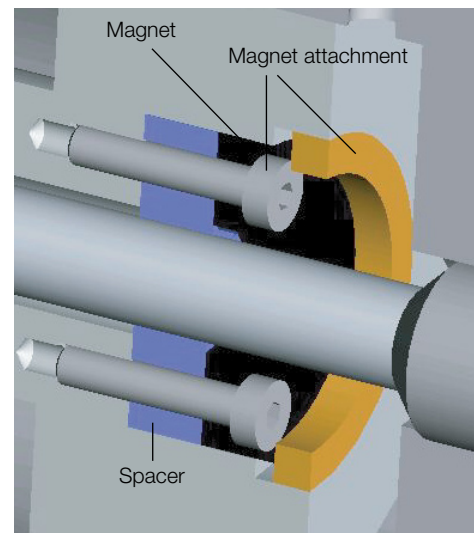


Fig. 4-7: Magnet attachment

BTL7-A/E501-M__-A/B/Y/Z(8)-S32/S115/KA__ Micropulse Linear Transducer - Rod-Style

5 Startup

5.1 Electrical connection

Depending on the model, the electrical connection is made using a cable (KA__) or a connector (S32 or S115). The wire assignments or pinout depends on the respective model (see Tab. 5-1, 5-2).

5.1.1 Connector version S32/Cable version KA__

S32 PIN	KA Cable color	Interface BTL7-...	
		-A501	-E501
1	YE yellow	not used ¹⁾	4...20 mA ²⁾
2	GY gray	0 V	
3	PK pink	10...0 V ²⁾	20...4 mA ²⁾
4	RD red	La (communication line)	
5	GN green	0...10 V ²⁾	not used ¹⁾
6	BU blue	GND ³⁾	
7	BN brown	+24 V	
8	WH white	Lb (communication line)	

Tab. 5-1: Pinouts connector S32/KA__

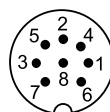


Fig. 5-1: Pinout for S32 connector (topview of connector on transducer)

5.1.2 Connector type S115

PIN	Interface BTL7-...	
	-A501	-E501
1	0 V (Pin 3)	
2	0 V (Pin 5)	
3	10...0 V ²⁾	20...4 mA ²⁾
4	La (communication line)	
5	0...10 V ²⁾	4...20 mA ²⁾
6	GND ³⁾	
7	+24 V	
8	Lb (communication line)	

Tab. 5-2: Pinout for S115 connector

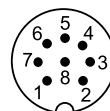


Fig. 5-2: Pinout for S115 connector (topview of connector on transducer)

- 1) Unused wires may be connected to GND on the controller side, but not to the shield.
- 2) Factory settings, freely configurable using PC software.
- 3) Reference potential for supply voltage and EMC GND.

5 Startup (cont.)

5.2 Shielding and cable routing



Defined ground!

The transducer and the control cabinet must be at the same ground potential.

Shielding

To ensure electromagnetic compatibility (EMC) observe the following:

- Connect transducer and controller using a shielded cable.
Shield: Braided copper shield with minimum 80% coverage.
- Connector version: Area connection of shield in connector with the connector body.
- Cable version: Connect cable shield to housing on transducer side.
Ground cable shield on controller side (connect to protection ground).

Magnetic Fields

The transducer system is a magnetostrictive system. Ensure that there is sufficient distance between the transducer and between the holding cylinder and strong, external magnetic fields.

Cable routing

Do not route the cable between the transducer, controller and power supply near high voltage cables (inductive stray noise is possible).

Bending radius for fixed cable

The bending radius for fixed cable must be at least twice the cable diameter.

Cable length

Linear Transducer	Maximum cable length ¹⁾	Cable diameter
BTL7-A	30 m	6 - 8 mm
BTL7-E	100 m	

Tab. 5-3: Cable lengths

1) Prerequisite: Construction, shielding and routing preclude the effect of any external noise fields.

5.3 Starting up the system



Note!

When starting up and if the displacement measurement system is part of a closed loop system whose parameters are not yet set, the system may exhibit uncontrolled movements. This could result in personal injury and equipment damage.

- ▶ Startup should be performed only by trained technical personnel.
- ▶ Observe safety instructions of the equipment or system manufacturer.

1. Check connections for tightness and correct polarity. Replace damaged connections.
2. Turn on the system.
3. Check measured values.
Especially after replacing the transducer or after repair by the manufacturer, check for correct null point and end point values. If necessary recalibrate the transducer (see page 13 ff).

5.4 Operating notes

- Check the function of the transducer and all associated components on a regular basis.
- Take the displacement measurement system out of operation whenever there is a malfunction. Secure the system against unauthorized use.

6

Configuring using the Micropulse Configuration Tool

6.1 Micropulse Configuration Tool

The Micropulse Configuration Tool allows Balluff transducers type BTL7-A/E501... to be quickly and simply configured on the PC.

The most significant features are:

- Online display of the current position of the magnet
- Graphical support for setting the functions and curves
- Display of information about the connected transducer
- Selectable number formats and units for display
- Resetting to factory settings is possible
- Calibration device can be locked
- Demo mode without having a transducer connected



Note!

The PC software and associated manual can be obtained in the Internet at www.balluff.com/downloads-btl7.

6.2 Connecting the USB communication box

For transducer models BTL7-A/E501-M...-S32 and BTL7-A/E501-M...-S115 (S32 or S115 connector) the communication box must be inserted between the transducer and controller. The communication box is connected to the PC using a USB cable.

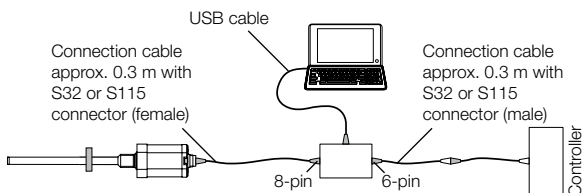


Fig. 6-1: Connecting the communication box using S32 or S115 connector

For a BTL7-A/E501-M...-KA__ transducer the communication lines La and Lb are connected to the USB communication box.

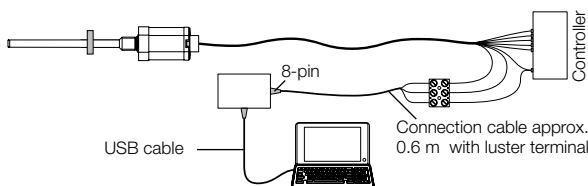


Fig. 6-2: Connecting the communication box with cable connection

6.3 Configuration possibilities

Prerequisites

- USB communication box connected to transducer and PC.
- Software correctly installed.
- Transducer connected to power supply.
- Magnet on transducer.

Magnets and outputs

- 2 Magnet selectable
- 2 Outputs independently assignable

Output functions

Position: Position in the measuring range.

Velocity: Velocity of the magnet, with the sign indicating the direction of motion. Movement from the start point to the end point is output with a plus sign, and movement from the end point to the start point with a minus sign.

Velocity (no sign): Velocity of the magnet, but the direction of motion cannot be read.

Differential position: Distance between two magnets.

This selection is only allowed if two magnets are selected.

Curve freely configurable

- The start and end points can be read (teach-in) or defined by using the mouse.
- The curve can be scaled by adjusting the output values.
- The curve can be inverted or copied from the other output.
- The limits can be adjusted to the measuring range.
- The error value can be set according to the limits.

Disabling the calibration device

The function for manually setting the transducer using the calibration device can be locked, so that configuration is only possible using the PC software.



Note!

The transducers may be connected to the communication box only for configuration. After configuration the communication box must be removed.

7 Setting using the calibration device

7.1 Calibration device

The calibration device is an ancillary unit for setting the transducer when it is not possible to configure it with PC and software.

Requirements

- Button function is unlocked by the PC software (button lock).
- The calibration device is in place.
- The transducer is connected to the system controller.
- Voltage or current values from the transducer can be read (using a multimeter or the system controller).

i If the button function is locked, the lock must be lifted using the PC software.

Settings

The transducer has the following factory settings which can be adjusted using the calibration device:

- One magnet,
- "Position" function on both outputs, Output 1 with rising curve and Output 2 with falling curve,
- Identical measuring range for both outputs.

During setting the start and end points for both outputs are set the same. No other function may be selected and no additional magnet used.

If the button function is locked, the lock can only be lifted if these conditions are met.

i Automatic deactivation!

If the buttons on the calibration device are not pressed for approx. 10 min., the Programming mode is automatically quit.

Values for null and end point

- Any desired position of the magnet can be used as the null or end point. The null and end points may not however be reversed.
- The absolute null and end points must lie within the minimum or maximum limits of what can be output.
- The distance between the null point and end point must be at least 4 mm.

i The last set value are always saved, regardless of whether the setting was made using the buttons or automatically after 10 min. have expired.

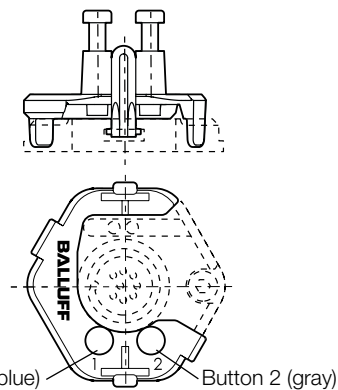
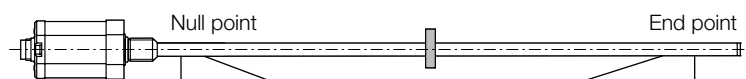


Fig. 7-1: Calibration device in place

7.2 Calibration procedure notes

- Before calibrating: Place the calibration device on the connection side of the transducer.
- When finished: Remove the calibration device to prevent changes.
- Keep the calibration device for later use.



Output gradient	Linear Transducer	Unit	Min. value	Null value	End value	Max. value	Error value
Rising	BTL7-A...	V	-0.5	0	+10.0	+10.5	+10.5
	BTL7-E...	mA	3.6	4.0	20.0	20.4	3.6
Falling	BTL7-A...	V	+10.5	+10.0	0	-0.5	-0.5
	BTL7-E...	mA	20.4	20.0	4.0	3.6	3.6

Tab. 7-1: Value table for factory settings

7 Setting using the calibration device (cont.)

7.3 Calibration procedure overview

7.3.1 Teach-in

The factory set null and end point is replaced by a new null and end point. The null and end points can be set independently of each other, and the output gradient changes.

i The detailed procedure for teach-in is described on page 17.

Steps:

- Move magnet to the new null position.
- Read null point by pressing the buttons.
 ⇒ The present end point is retained.

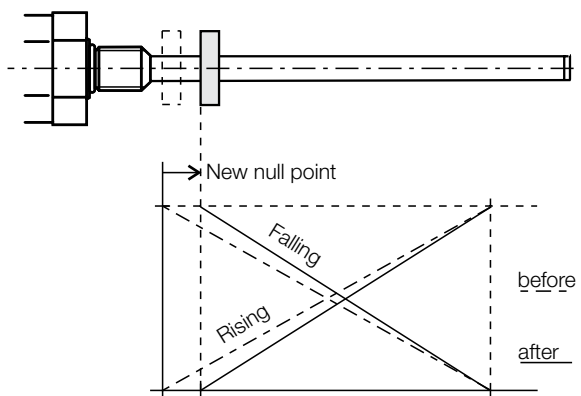


Fig. 7-2: Reading the new null point

- Move magnet to the new end position.
- Read end point by pressing the buttons.
 ⇒ The present null point is retained.

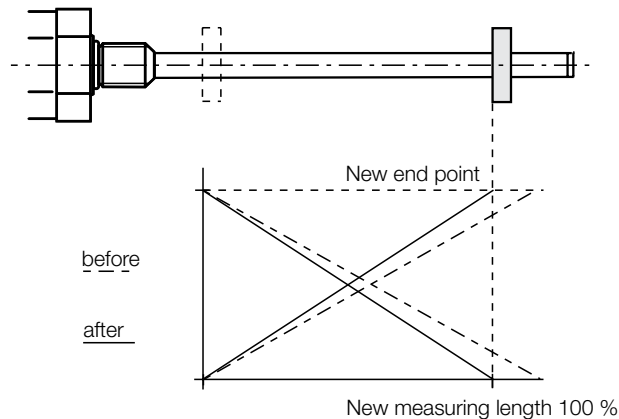


Fig. 7-3: Reading the new end point

- The curves can be inverted by pressing the buttons.
 ⇒ When inverting, the curves for both outputs are inverted. For example, the rising curve of Output 1 becomes a falling curve and the falling curve of Output 2 becomes a rising curve.

7 Setting using the calibration device (cont.)

7.3.2 Adjusting

The factory set null and end point can be replaced by a new start and end point and the associated output values can be adjusted. The start and end values can be adjusted as desired up to the limits.

i The detailed procedure for adjustment is described starting page 18.

Steps:

- Move magnet to the new start position.
- Read new start point by pressing the buttons.
- Set new start value by pressing the buttons.

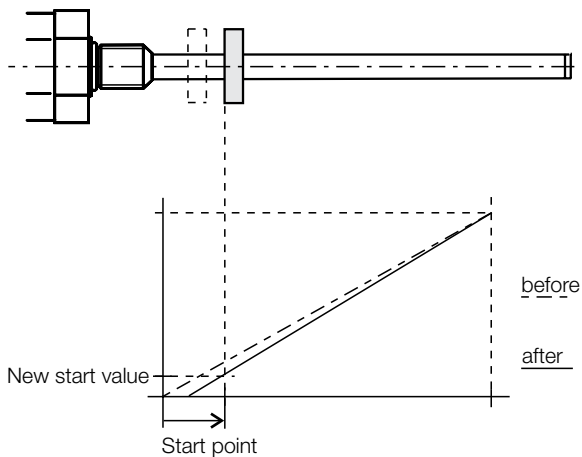


Fig. 7-4: Adjusting the new start value

- Move magnet to the new end position.
- Read end point by pressing the buttons.
- Set new end value by pressing the buttons.

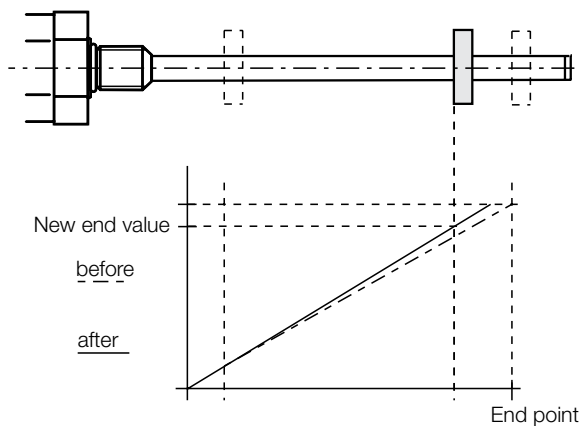


Fig. 7-5: Adjusting the new end value

7.3.3 Reset

Restoring the transducer to its factory settings.

i The detailed procedure for the reset is described on page 20.

8

Teach-in using the calibration device



Note!

Teach-in while the system is running may result in malfunctions.
 ► Stop the system before performing teach-in.

LED indicator Displayed values (example)
 LED1 LED2 at 0...10 V at 4...20 mA

Output:

- Transducer with magnet within measuring range



		5.39 V	9.15 mA
--	--	--------	---------

Activate teach-in

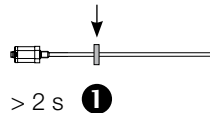
- ❶ Hold down for at least 4 s.

> 4 s ❶

		5.39 V	9.15 mA
--	--	--------	---------

Set null point

- Bring magnet to the new null point.
- ❶ Hold down for at least 2 s.

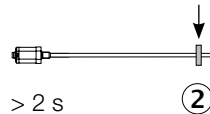


		1.04 V	4.82 mA
		0.00 V	4.00 mA

⇒ After releasing, the new null point is set.

Set end point

- Bring magnet to the new end point.
- ❷ Hold down for at least 2 s.



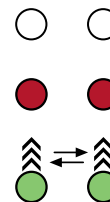
		9.89 V	19.13 mA
		10.00 V	20.00 mA

⇒ After releasing, the new end point is set.

Invert curves

- Hold down ❶ and ❷ together for at least 4 s, until both LEDs come on red.

> 4 s ❶ + ❷



⇒ After releasing, the curves for both outputs are inverted.

Quit Teach-in

- Press ❶ and ❷ briefly (< 1 s).
- ⇒ After releasing, the present position value is displayed.

< 1 s ❶ + ❷



The individual steps for the settings can be selected as desired. Teach-in can be quit at any desired point in time.

LED legend: LED not on

LED green solid on

LED red

LED 1 and LED 2 flashing green-green in alternation

9 Adjusting using the calibration device



Note!

Adjustment while the system is running may result in malfunctions.

- Stop the system before performing adjustment.

LED indicator Displayed values (example)
 LED1 LED2 at 0...10 V at 4...20 mA

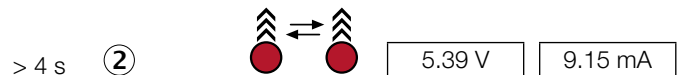
Output:

- Transducer with magnet within measuring range



Activate adjusting

- ② Hold down for at least 4 s.

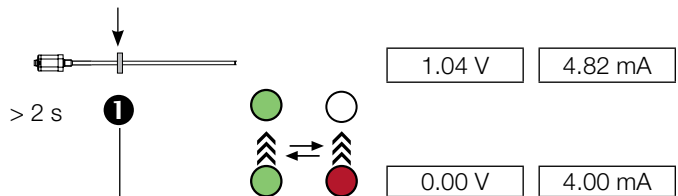


Set start point

- Bring magnet to the new start point.

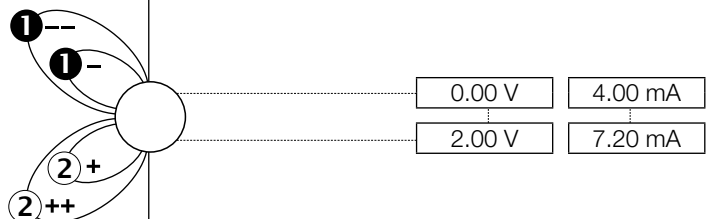
- ① Hold down for at least 2 s.

⇒ The new start point is set with the last valid start value.



Adjust start value

- The start value can be changed using ① and ② ¹⁾. The curve gradient changes (see page 16).



- Quit calibration procedure: Briefly press ① and ② at the same time (< 1 s).

⇒ Set position value is saved.



Set end point, adjust end value and quit adjusting, see page 19.



The individual steps for the settings can be selected as desired. Adjusting can be quit at any desired point in time.

1) Press button briefly: Present value is increased or decreased by approx. 1 mV or 1 μ A. If a button is held down longer than 1 s, the step interval is increased.

LED legend:

○ LED not on

● LED green solid on



LED 1 and LED 2 flashing green-red in alternation



LED 1 and LED 2 flashing red-red in alternation

9

Adjusting using the calibration device (cont.)



Note!

Adjustment while the system is running may result in malfunctions.

- Stop the system before performing adjustment.

LED indicator Displayed values (example)

LED1 LED2 at 0...10 V at 4...20 mA

Set end point

- Bring magnet to the new end point.

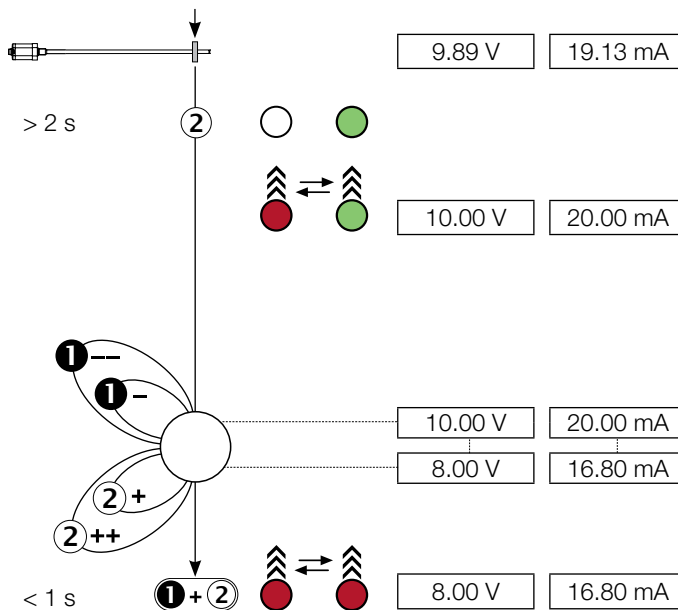
- ② Hold down for at least 2 s.

⇒ The new end point is set with the last valid end value.

Adjust end value

- The end value can be changed using ① and ②¹⁾. The curve gradient changes (see page 16).

- Quit calibration procedure: Briefly press ① and ② at the same time (< 1 s).
 ⇒ Set position value is saved.



Quit adjusting

- Press ① and ② briefly at the same time (< 1 s).
 ⇒ After releasing, the present position value is displayed.

1) Press button briefly: Present value is increased or decreased by approx. 1 mV or 1 μ A. If a button is held down longer than 1 s, the step interval is increased.

LED legend:

○ LED not on

● LED green solid on

LED 1 and LED 2 flashing red-green in alternation

LED 1 and LED 2 flashing red-red in alternation

10 Resetting all values using the calibration device (Reset)



Note!

Resetting the values while the system is running may result in malfunctions.
 ► Stop the system before performing the reset.

The Reset function can be used to restore all the settings to the factory settings. For a Reset the magnet may also be located outside the measuring range.

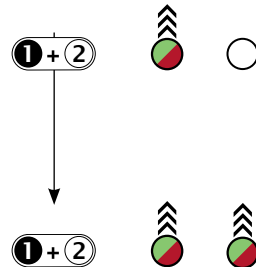
1. Activate Reset

- Hold down ① and ② simultaneously for at least 4 s. > 4 s
- Release buttons.
- ⇒ Reset is activated.

2. Reset

- Hold down ① and ② for at least 4 s. > 4 s
- Release buttons.
- ⇒ All values are reset.
- ⇒ Current position value is displayed.
- ⇒ Reset is deactivated.

LED indicator
LED1 LED2



LED legend: ○ LED not on



LED green-red flashing



LED 1 and LED 2 flashing green-red together

BTL7-A/E501-M _ _ _ -A/B/Y/Z(8)-S32/S115/KA _ _ Micropulse Linear Transducer - Rod-Style

11

Technical Data

11.1 Accuracy

Typical values at 24 V DC and room temperature. BTL7-A501-... and BTL7-E501-... Nominal stroke length BTL = 500 mm.

Ready immediately, full accuracy after warmup phase.

Together with magnet BTL-P-1013-4R, BTL-P-1013-4S, BTL-P-1014-2R, BTL-P-1012-4R or BTL-P-0814-GR-PAF.



For special versions, other technical data may apply.
Special versions are indicated by the suffix -SA on the part label.

Repeatability

Voltage, typical	±10 µm
Current, typical	±5 µm

Sampling rate

With one magnet:

Depends on nominal stroke length	250 µs ¹⁾ ... 5.4 ms
For nominal stroke length = 500 mm	500 µs

With two magnets:

Depends on nominal stroke length	375 µs ¹⁾ ... 8.1 ms
For nominal stroke length = 500 mm	750 µs

Non-linearity at

nominal stroke length ≤ 500 mm	±50 µm
nominal stroke length > 500 to ≤ 5500 mm	±0.01 % FS
nominal stroke length > 5500 mm	±0.02 % FS

Temperature coefficient

(nominal stroke length = 500 mm,
magnet in middle of measuring range) ≤ 30 ppm/K

11.2 Ambient conditions

Operating temperature	-40 °C to +85 °C
Storage temperature	-40 °C to +90 °C
Relative humidity	< 90 %, non-condensing
Pressure rating (when installed in hydraulic cylinders), for Ø 8 mm	≤ 250 bar
for Ø 10.2 mm	≤ 600 bar
Shock rating per IEC 60068-2-27 ²⁾	150 g/6 ms
Continuous shock per IEC 60068-2-29 ²⁾	150 g/2 ms
Vibration per IEC 60068-2-6 ²⁾ (note resonant frequency of the outer rod)	20 g, 10 – 2000 Hz
Degree of protection per IEC 60529	
Connector S32/S115 (when attached)	IP67
Cable KA _ _	IP68 ²⁾

11.3 Supply voltage (external)

Voltage, stabilized	10 to 30 V DC
Ripple	≤ 0.5 V _{pp}
Current draw (at 24 V DC)	
BTL7-A501-...	≤ 150 mA
BTL7-E501-...	≤ 180 mA
Inrush	≤ 500 mA/10 ms
Polarity reversal protected	to 36 V
Overvoltage protection	to 36 V
Dielectric strength GND to housing	500 V AC

11.4 Outputs

BTL7-A501

Output voltage	
max. configurable ³⁾	-10...10 V / 10...-10 V
Factory settings	0...10 V / 10...0 V
Load current	≤ 5 mA

BTL7-E501

Output current	
max. configurable ³⁾	0...20 mA / 20...0 mA
Factory settings	4...20 mA / 20...4 mA
Load resistance	≤ 500 Ohms

Short circuit protected	Signal line to 36 V Signal line to GND
-------------------------	---

11.5 Communication lines La, Lb

Short circuit protected	Signal line to 36 V Signal line to GND
-------------------------	---

11.6 Dimensions, weights

Diameter of outer rod	8 mm or 10.2 mm
nominal stroke length for Ø 8 mm	≤ 1016 mm
Ø 10.2 mm	≤ 7600 mm
Weight (depends on length)	approx. 2 kg per m
Housing material	Anodized aluminum
Outer rod material	Stainless steel 1.4571
Outer rod wall thickness for Ø 8 mm	0.9 mm
for Ø 10.2 mm	2 mm
Young's modulus	approx. 200 kN/mm ²
Mounting thread	M18×1.5 or 3/4"-16UNF

- 1) Position output only. For velocity output, next higher sampling rate (500 µs or 750 µs).
- 2) Individually determined according to Balluff Factory Standard
- 3) Only using PC software (Configuration Tool)

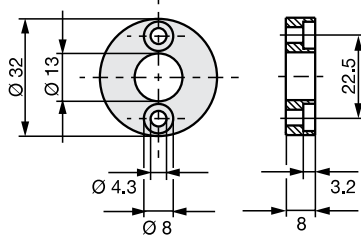
12

Accessories

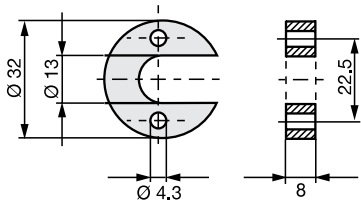
Accessories not included in scope of delivery and must be ordered separately.

12.1 Magnets

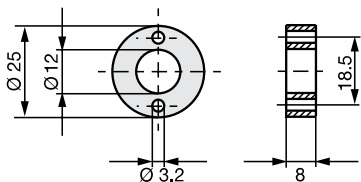
BTL-P-1013-4R



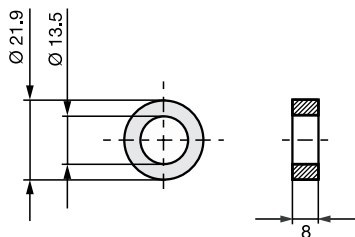
BTL-P-1013-4S



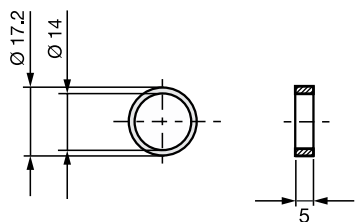
BTL-P-1012-4R



BTL-P-1014-2R



BTL-P-0814-GR-PAF



Magnet

BTL-P-1013-4R, BTL-P-1013-4S, BTL-P-1012-4R, BTL-P-1014-2R:

Weight: approx. 10 g
 Housing: Anodized aluminum
 Operating temperature: -40 °C to +85 °C

BTL-P-0814-GR-PAF:

Weight: approx. 2 g
 Housing: Ferrite bound in PA
 Operating temperature: -40 °C to +85 °C

Included with BTL-P-1013-4R, BTL-P-1013-4S, BTL-P-1012-4R magnet:

Spacer: 8 mm, Polyoxymethylene (POM)

Magnet BTL5-P-4500-1:

(electromagnet)

Weight: approx. 90 g
 Housing: Plastic
 Operating temperature: -40 °C to +60 °C

12.2 Mounting nuts

- Mounting nut M18×1.5:
BTL-A-FK01-E-M18×1.5
- Mounting nut 3/4"-16UNF:
BTL-A-FK01-E-3/4"-16UNF

Fig. 12-1: Magnet installation dimensions

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Accessories (cont.)

12.3 Connectors

BKS-S32M-00:

- Straight connector, for user assembly
- BKS-S32M-00: M16 per IEC 130-9, 8-pin

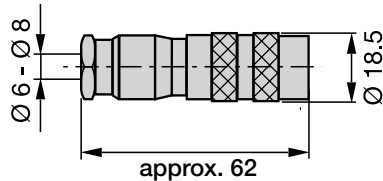


Fig. 12-2: BKS-S32M-00 connector

BKS-S33M-00:

- Right-angle connector, for user assembly
- BKS-S33M-00: M16 per IEC 130-9, 8-pin

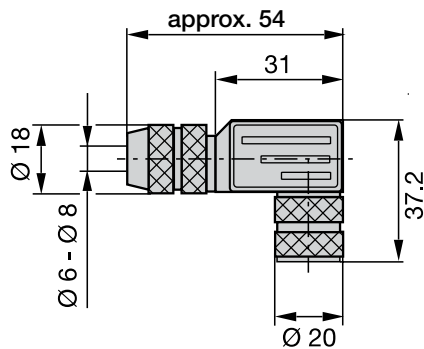


Fig. 12-3: BKS-S33M-00 connector

BKS-S115-PU-__:

- Straight connector, molded-on cable, preassembled
- M12, 8-pin
- Various cable lengths can be ordered, e.g. BKS-S115-PU-05: Cable length 5 m

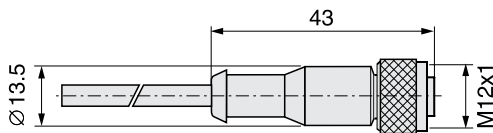


Fig. 12-4: Connector BKS-S115-PU-__

BKS-S116-PU-__:

- Right-angle connector, molded-on cable, preassembled
- M12, 8-pin
- Various cable lengths can be ordered, e.g. BKS-S116-PU-05: Cable length 5 m

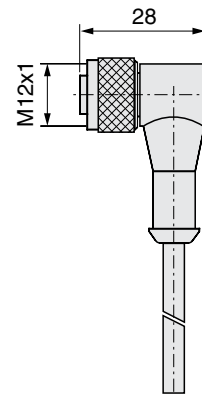


Fig. 12-5: Connector BKS-S116-PU-__

12.4 USB communication box

BTL7-A-CB01-USB-S32:

- For BTL7-A/E501... with S32 connector.
- Included in scope of delivery: USB communication box, USB cable, 2 adapter cables 0.3 m long each, condensed guide

BTL7-A-CB01-USB-S115:

- For BTL7-A/E501... with S115 connector.
- Included in scope of delivery: USB communication box, USB cable, 2 adapter cables 0.3 m long each, condensed guide

BTL7-A-CB01-USB-KA:

- For BTL7-A/E501... with cable connection.
- Included in scope of delivery: USB communication box, USB cable, 1 adapter cable approx. 0.6 m long, condensed guide

BTL7-A/E501-M____-A/B/Y/Z(8)-S32/S115/KA____ Micropulse Linear Transducer - Rod-Style

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Ordering code

Example:

BTL7 - A 5 0 1 - M0500 - B - S32

Linear Transducer

Interface

A = Analog interface, voltage output 0...10 V (factory settings)

E = Analog interface, current output 4...20 mA (factory settings))

Supply voltage

5 = 10 to 30 V DC

outputs

01 = 2 outputs, configurable

Nominal stroke

M0500 = Metric specification in mm, nominal stroke length 500 mm

Construction

A = Metric mounting thread M18×1.5, rod diameter 10.2 mm

B = Metric mounting thread M18×1.5, O-ring, rod diameter 10.2 mm

Y = Inch thread 3/4"-16UNF, rod diameter 10.2 mm

Z = Inch thread 3/4"-16UNF, O-ring, rod diameter 10.2 mm

A8 = Metric mounting thread M18×1.5, rod diameter 8 mm

B8 = Metric mounting thread M18×1.5, O-ring, rod diameter 8 mm

Y8 = Inch thread 3/4"-16UNF, rod diameter 8 mm

Z8 = Inch thread 3/4"-16UNF, O-ring, rod diameter 8 mm

Electrical connection

S32 = Connector S32, M16 per IEC 130-9, 8-pin

S115 = Connector S115, M12, 8-pin

KA05 = Cable, 5 m

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Appendix

14.1 Converting units of length

1 mm = 0.0393700787 inch

Conversion table:

mm	inch
1	0.03937008
2	0.07874016
3	0.11811024
4	0.15748031
5	0.19685039
6	0.23622047
7	0.27559055
8	0.31496063
9	0.35433071
10	0.393700787

Tab. 14-1: Examples of conversion for mm-inch

1 inch = 25.4 mm

Conversion table:

inch	mm
1	25.4
2	50.8
3	76.2
4	101.6
5	127
6	152.4
7	177.8
8	203.2
9	228.6
10	254

Tab. 14-2: Example for converting inch-mm

14.2 Part label

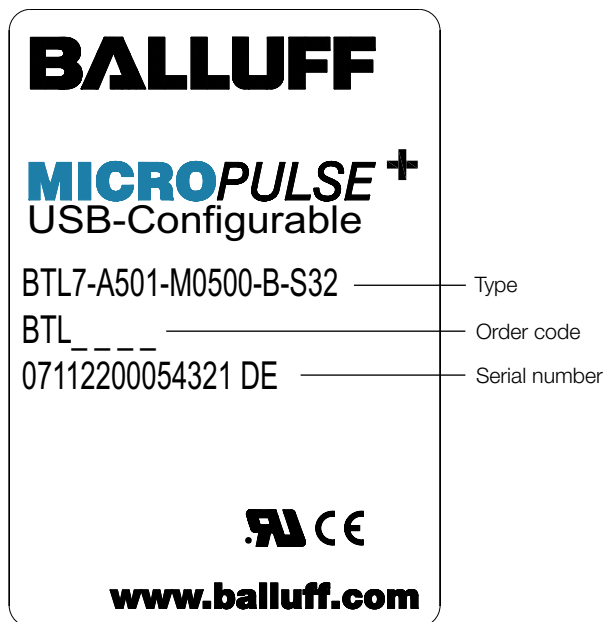


Fig. 14-1: Part label BTL7



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